REMARKS

Claims 1–7 and 13–19 are pending in the application. In the Office action dated February 6, 2009, claims 1–7 and 13–19 were rejected. Applicants submitted a Response to the Final Office action dated May 6, 2009 which included a request for reconsideration of the rejected claims. Applicants then received an Advisory action dated May 14, 2009, indicating that the request for reconsideration did not place the application in condition for allowance.

Responsive to the Final Office action dated February 6, 2009 and the Advisory action dated May 14, 2009, Applicants have amended claim 17, and added new claims 20 and 21. In view of the above amendments and the following remarks, Applicants respectfully request reconsideration of the application.

Request for Continued Examination

In order to ensure consideration of the above amendments and the following remarks, Applicants hereby submit a Request for Continued Examination under 37 C.F.R. § 1.114.

Rejections under 35 U.S.C. § 112

Claim 17 is rejected under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

In particular, claim 17 recites "producing the oxide superconductor by partial melting and solidifying the precursor in said state; wherein the solidified portion is not an oxide superconductor". The Examiner asserts that it is not clear how an oxide superconductor can be produced and still not be an oxide superconductor.

Without acquiescing in the Examiner's rejection, and in the interest of furthering the prosecution of the application, Applicants have amended claim 13 to clearly recite an oxide superconductor that includes a solidified portion that is formed after melting and exposure to the outside, and amended claim 17 to recite that the portion solidified after melting and exposed to the outside is not an oxide superconductor.

In view of the amendments to claims 13 and 17, Applicants suggest that claim 17 sets out and circumscribes the claimed subject matter with both clarity and particularity. Applicants therefore respectfully request the withdrawal of the rejection of claim 17 under 35 U.S.C. § 112, second paragraph.

Regarding Superconductivity

Before addressing specific rejections, Applicants believe it may be helpful to discuss certain salient aspects of the claimed invention.

For some select materials, when that material is cooled to an ultra low temperature a unique phenomenon occurs in which the electrical resistance of the material drops to zero. This phenomenon is known as "superconductivity", and the material which exhibits this behavior is called a “superconductor”.

A material entering a superconductive state is said to undergo a phase transition. The phenomenon of phase transition may be compared, for example, to the phenomenon wherein water becomes ice. The temperature at which the phase of a material changes to a superconductive phase is known as its superconductive transition temperature. The temperature, pressure, etc. at which the phase transition occurs is called the transfer point, and is determined based on thermodynamic conditions.

On the other hand, a material which does not undergo a transition to a superconductor is said to exhibit a normal conduction phase.

In the presently application, a method is claimed wherein an oxide superconductor is generated from a (non-superconductive) precursor of the oxide superconductor. A phase transition occurs when the oxide superconductor is generated from the precursor material.

The Examiner appears to contend that the precursor recited in the rejected claims was also a superconductor, prior to its conversion to an oxide superconductor. For example, as described in Example 1 of the present specification, a pellet which is a mixture of a sintered

material ($NdBa_2Cu_3O_{7-x}$ (Nd123)), oxide ($Nd_4Ba_2Cu_2O_{10}$) and silver oxide (Ag_2O) is heated at 1040 °C in pure oxygen to prepare a suitable precursor.

However, this processing is referred to as calcination, and phase transition to the desired oxide superconductor has not occurred. That is, the pellet is in an amorphous, and non-superconducting state.

Returning to Example 1 of the present specification, in order to cause the necessary crystallization subsequent to calcination, the precursor of Example 1 is sintered for one hour at a temperature (1100 °C) which is higher than that used for calcination, and then, the pellet is cooled to 1010 °C over 2 hours, and a seed crystal, which is used as a template for the growth of the desired crystalline material, is placed on the top surface of the pellet while it remains partially molten. The pellet is then further cooled to 1000 °C over 5 minutes, and subsequently, the pellet is slowly cooled to 989 °C at the rate of 1 °C/hour and held for 60 hours followed by furnace-cooling to obtain a material capable of exhibiting superconductivity.

Applicants direct the Examiner's attention to the specification at page 24. In particular, the crystal grows to be a superconductor after a pellet enters a partially molten state and a seed crystal is placed thereon as a starting point, although the description regarding the calcination process is omitted.

It would be well-known to one of person with ordinary skill in the art that the partial melting and solidifying method is conducted to generate a superconductive material. Further, that a precursor, which is not a superconductor (and does not possess a crystalline state) is preferably treated by calcination, heated to be in a partially molten and solidifying state at peritectic temperature or more in order to cause a peritectic reaction, and then, the heated precursor is cooled in accordance with the predetermined cooling steps to grow a crystalline material. That is, after heating is conducted up to the peritectic temperature or more, the precursor is maintained at a predetermined temperature lower than the peritectic temperature,

for a predetermined time in order to generate a superconductor. Without a specific cooling step, the precursor material will generally not produce a superconductor.

Furthermore, in reference to the specification at pages 26 to 27, "…based on the formula (I), a decomposition into Y_2BaCuO_5 (Y211 phase) and L (liquid phase) ($3BaCuO_2 + 2CuO$) is taking place inside the precursor 5" while it is in a partial molten state, and "a crystal of the oxide superconductor having the composition ratio of $YBa_2Cu_3O_{7-x}$ (Y123 phase) grows with the seed crystal as a starting point,…. the whole body of the precursor 5 is crystallized, and a bulk of an oxide superconductor having the composition YBa_2Cu3O_{7-x} (Y123 phase) is obtained."

Furthermore, in reference to the specification at page 4, the partially molten state of $YBa_2Cu_3O_{7-x}$ decomposes as shown in the formula (I) at the peritectic temperature or higher thereof (where L represents a liquid phase, and X represents the amount of oxygen deficiency in the lattice thereof):

$$2YBa_2Cu_3O_{7-x}\ (Y123) = Y_2BaCuO_5\ (Y211) + L(3BaCuO_2 + 2CuO)\ (I)$$

In this way, without the recited partially melting and solidifying step, as well as the predetermined cooling step, a precursor material will not, and cannot, become a superconductor. A person having ordinary skill in the art of the preparation and study of yttrium-barium-copper-based superconductors would be well aware of what constituted a precursor for a superconductor of the present invention, as well as its properties.

In addition, Examples 2 and 3 of the specification disclose precursors which have not been heated. Accordingly, the specification makes it is clear a precursor refers to a material wherein crystal growth thereof has not occurred, and which does not exhibit superconductivity.

In an attempt to further clarify the nature of the recited precursor, and the particular differences between the claimed invention and the cited references, Applicants have added new dependent claims 20 and 21, which specifically recite a precursor that is not a superconductor.

Furthermore, in order to show that calcination of precursor materials is generally conducted in the superconductor field, we hereby provide the documents "Fabrication and characterization of large Nd-Ba-Cu-O grains prepared under low oxygen pressure" (*J. Mat. Res.*, Vol. 15, no. 1, Jan 2000), and "High critical currents in Y-Ba-Cu-O superconductors" (*Appl. Phys. Lett*. 52 (24) 13 June 1988) wherein precursor materials are preheated before crystallization thereof is conducted (copies enclosed for the convenience of the Examiner).

Rejections under 35 U.S.C. § 103

The Examiner has rejected claims 1–7, 18, and 19 under 35 U.S.C. § 103(a) as being unpatentable over Iida et al. (U.S. Patent no. 7,001,870).

Claims 1–7 and 13–16 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Murakami (U.S. Patent no. 5,521,150).

The Examiner has asserted that the present claims would have been obvious to one of ordinary skill in the art over the teachings of Iida et al, as the reference is directed to a process of melt processing to produce an oxide superconductor by placing a meltable compound on the superconductor, followed by melting and solidifying the same. Applicants respectfully disagree.

In order to establish the *prima facie* obviousness of a claim, the cited references must disclose every element of the claim, as it is set out in that claim. Furthermore, there must be some incentive to combine and/or modify the cited references as suggested by the Examiner, who must provide a rational articulation of such reasoning.

As discussed in their previous response, and as explained in greater detail above, both US Patent No. 7001870 (Iida) and US Patent No. 5521150 (Murakami) disclose methods wherein superconductors are prepared and they are bonded to each other via adhesive materials. Specifically, Iida et al. is directed to a method for joining existing rare-earth oxide

superconductors together using a solder, while Murakami is directed to a method of joining existing oxide superconductors via a melting process under pressure. Neither reference discloses the precursor and the method as recited in the rejected claims.

Furthermore, also as argued in the response to the previous Office Action, neither Iida nor Murakami teach or suggest the following characteristics of the invention of claims 1 and 13:

(I) A precursor of an oxide superconductor is placed on a substrate material, which contains a pure metal or a compound which is meltable in the precursor when the precursor is partially molten.

(II) An oxide superconductor is produced by partial melting and solidifying the precursor places on a substrate material.

Since neither reference discloses the elements of independent claims 1 and 13, Applicants respectfully suggest that the *prima facie* obviousness of claims 1 and 13 has not been established. Since claims 1 and 13 are not rendered obvious by the cited references, Applicants suggest that dependent claims 2 to 7, and 14 to 19 are similarly not rendered obvious by the cited references, for at least the reasons provided for claims 1 and 13. Applicants therefore respectfully request the withdrawal of the rejection of claims 1–7 and 13–19 under 35 U.S.C. § 103.

Obviousness-Type Double Patenting

Claims 1–7, 18, and 19 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1–11 of U.S. Patent no. 7,001,870 (Iida et al.).

The Examiner asserts that the claims are not patentably distinct from each other because the claims of Iida et al. are directed to a method for producing an oxide superconductor by melt processing. Applicants respectfully disagree.

For at least the reasons provided above in distinguishing the rejected claims over Iida et al. and Murakami, Applicants suggest that claims 1–11 of Iida et al., which are directed

exclusively at a method for joining existing oxide superconductors, does not render the claimed subject matter obvious, as the rejected claims are directed to the preparation of an oxide superconductor from an oxide superconductor precursor, as discussed in substantial detail above. Applicants therefore respectfully request the withdrawal of the rejection of claims 1–7, 18, and 19 under the doctrine of nonstatutory obviousness-type double patenting.

Applicants suggest that the claims are now in condition for allowance. If there are any questions regarding this paper, or if a telephone conference would prove helpful, the Examiner is encouraged to contact the undersigned agent.

CERTIFICATE OF E-FILING

I hereby certify that this correspondence is being transmitted electronically via the U.S. Patent and Trademark Office EFS-Web System on 06 August 2009.

/ Stephen R. Pendleton /

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Respectfully submitted,

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